

THE CONSUMPTION FUNCTION: A HISTORY

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THIS ESSAY'S content is, as is suggested by the title, a history of the consumption function. It is a history which treats heavily of the role of the consumption function in the Keynesian economic schema, and provides a detailed and carefully constructed examination of the Keynesian analysis of aggregate consumption, as contained in chapters 8, 9 and 10 of the "General Theory".

The subsequent refinements to the theory presented by Modigliani and Friedman are characterised as being appropriate responses to empirical evidence yielded by econometric testing of Keynes' theory. Both the Life Cycle and Permanent Income hypotheses are given extensive treatment. The final section examines the application of rational expectations to the consumption function, as embodied in the Surprise Consumption Function of Robert Hall. Theoretical and empirical objections to this model, most notably those of Muellbauer, are then discussed.

KEYNES AND THE CONSUMPTION FUNCTION

The three chapters of book III of "The General Theory of Interest, Employment and Money" are devoted to the consumption function. Keynes defines the propensity to consume as the functional relationship c between Y_w , a given level of income in terms of wage units, and C_w , the expenditure on consumption out of that level of income, so that :

$$C_w = c (Y_w). \quad (\text{equation 1})$$

This having been established, Keynes notes that the amount spent in an economy on consumption depends on three categories of determinant; the level of income, other objective attendant circumstances and finally a set of institutional and psychological "subjective" factors.

These subjective influences, although Keynes is not sparing in his enumeration of them, however, are exogenous to his analysis, as they are; "unlikely to undergo a material change over a short period of time, except in abnormal or revolutionary circumstances". So for the purposes of his paradigm, then, the propensity to consume is especially dependent on the objective factors, of which Keynes listed six.

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Firstly, the propensity to consume will be affected by a "change in the wage unit", as consumption is, strictly speaking, a function of real income. Secondly, it will depend on the difference between income and net income, a relatively unimportant factor. Keynes' third factor was "windfall changes in capital values not allowed for in calculating net income". Keynes classified this as a major factor, and was the basis for his assertion that "consumption of the wealth-owning class may be extremely susceptible to unforeseen changes in the money value of its wealth". The fourth factor, the rate of interest, does not assume the importance assigned to it in Classical and neo-Classical analysis: "There are not many people who will alter their way of living because the rate of interest has fallen from 5% to 4%, if their aggregate income is the same as before."

The remaining influences on the propensity to consume were changes in fiscal policy and "changes in expectations of the relationship between the present and the future levels of income". Of the former we ought to note Keynes' emphasis on it as a means of increasing the propensity to consume, by way of redistribution from rich to poor. Of the latter, we may note in ironic fashion, Keynes' comment that "it is a matter about which there is, as a rule, too much uncertainty for it to exert such influence". It was Keynes' oversight with regard to this factor that would lead to the subsequent modification of the Keynesian paradigm contained in normal income theories.

Having considered the above, Keynes stated that the propensity to consume would be a reasonably stable function, and therefore, that the amount of aggregate consumption would be related in a stable manner to aggregate disposable income. In today's familiar notation :

$$C=F(Y). \quad (\text{equation 2})$$

Firstly, we note that the average propensity to consume (APC) decreases as income increases, implying that the marginal propensity to consume (MPC) lies between 0 and 1. For Keynes, this was a: "fundamental psychological law upon which we are entitled to depend with great confidence". Secondly, the APC is greater than the MPC, implying that at some low income level, consumption exceeds income. Thirdly, the marginal propensity to consume itself decreases as income rises, yielding a consumption function such as C1 in figure 1. The radical import of the Keynesian orthodoxy in this regard derives from the very postulation of an aggregate consumption function, whereas none had been explicitly proffered before, and because it is a notable component of his direct confrontation with the Classical view. To see this, we may note briefly the basic tenets of the Classical model.

In Classical theory, supply created its own demand. Consumption, labour, capital, supply and therefore output were planned simultaneously in accordance with preferences and prices. The labour market was the co-ordinating strategic

market of a system whereby household preferences yielded the labour supply function and where the accumulated stock of capital and the technical determinants of production yielded the production and labour demand function. Flexible prices ensured the equating of labour supply and demand at full employment levels. Say's Law held as factor incomes served as demand for the goods produced in the economy. In other words, national income was determined by supply .

Classical economics, therefore, did not require, nor did it have, an aggregate consumption function, only a theory of individual consumption and firm investment, and the Walrasian notion of general equilibrium to ensure the full employment of resources. Were a classical economist to be pressed on the issue, however, he might argue that consumption was dependent on income, the rate of interest, and real balances (the Pigou effect):

$$C=F(Y, i, M/P). \quad (\text{equation 3})$$

In Classical economics, however, no stable causality was supposed to run from C to Y. By contrast, C and Y were linked, at a microeconomic level via the budget constraint. Furthermore, as has already been noted, the stress placed on the role of interest rates in determining consumption in Classical theory was very much questioned by Keynes, who argued that the interest inelasticity of consumption might be low, arising from the relevant substitution and income effects cancelling each other out.

Consumption was a component of Keynes' effective demand (the actual aggregate demand for commodities in a closed economy, as opposed to pure wants). It was through the notion of an effective demand, comprised of consumption, investment, and government expenditure, that Keynes' rebuttal of Say's Law was directed. The commonplace empirical contradiction of that law by way of the phenomena of unemployment and recessions were theoretically buttressed by Keynes' arguments to the effect that it was effective demand which determined output, not supply; and that equilibrium could occur at employment levels less than full employment.

Keynes' hypothesis provided impetus for empirical investigation, but the consequent findings did not yield unequivocal verification of the theory. Firstly, shifts in the consumption function observed in a number of post-war studies brought the alleged stability of the consumption function into question. Secondly, while research involving cross-section budget data supported the Keynesian notion of a Consumption function like C1; long-run time series studies, such as Kuznets' famous 1946 study, seemed to imply that consumption was a linear function of disposable income, with a constant marginal propensity to consume, as in C2. This was in direct contradiction to the prescripts of the Keynesian thesis.

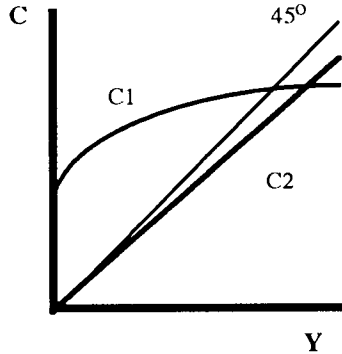


Figure 1: Alternative Consumption functions as implied by different studies.

Duesenberry (1952) provided an early attempt at reconciling the findings by pointing out that relative income, not absolute income, was the relevant concept of income. While Duesenberry achieved a plausible reconciliation of the conflicting econometric findings, he ignored the role of wealth, and its influence on the consumer's expectation of future income. The present consensus is that normal income theories, such as those developed by Modigliani and Friedman, offer a more satisfactory rationale for hitherto observed empirical conflicts (and one which is intuitively more appealing).

NORMAL INCOME THEORIES: LIFE-CYCLE AND PERMANENT INCOME HYPOTHESIS

Modigliani's Life-Cycle Hypothesis (1954) argues that an individual optimizes by maintaining a stable trend path of consumption through his or her lifetime. This is achieved by a redistribution of resources from mid-life (t_0 to t_1) and to retirement (t_1 to Y), by an appropriate use of the capital market for savings and dissavings purposes.

Algebraically, current consumption is a fraction b_t of the present value of total resources V_t accruing to the individual over his lifetime :

$$C_t = b_t V_t \quad (\text{equation 4})$$

$$V_t = w_{t-1} + Y_t + \sum_{\theta=t+1}^Y \frac{y_\theta}{(1+r)^\theta} \quad (\text{equation 5})$$

w_{t-1} being net worth from the previous period, y_t being current income and

$\sum_{t=0}^n \frac{y_t}{(1+r)^t}$ being the present value of expected future income from employment over the individual's remaining lifetime n .

Modigliani's reconciliation of cross section and time series data was that the latter captured the long run relationship in equation 4, where b_1 was the long run MPC. Cross section budget data would typically capture individuals at different stages of their lives. As is evident from figure 2, in both the young and the old, a coincidence of high MPCs would occur with relatively low income levels, while in middle age, the studies would indicate a concurrence of low MPC and high income.

C, Y

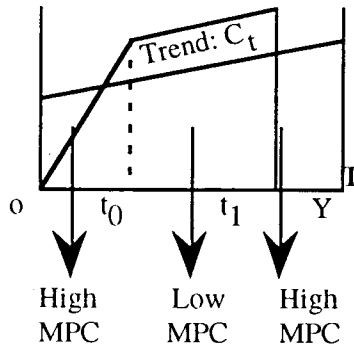


Figure 2: The Life Cycle Hypothesis

Friedman's Permanent Income Hypothesis (1957) argued that permanent consumption was a given proportion of permanent income:

$$C_p = kY_p \quad (\text{equation 6})$$

Friedman defines permanent income as the "amount a consumer unit could consume, or believes that it could, whilst maintaining its wealth intact" whereas permanent consumption is "the value of services that it is planned to consume during the period in question".

One of the virtues of the Friedman model was the attention it paid to stochastic variations in income, and their consequent implications for consumer behaviour. Friedman stated that permanent income and consumption bore the following relations to their transitory and measured components:

$$Y_p = Y_m - Y_t \quad (\text{equation 7})$$

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$$C_p = C_m - C_t \quad (\text{equation 8})$$

He further stated that the following correlation co-efficients were equated to zero :

$$R_{ypt} = 0 \quad (\text{equation 9})$$

$$R_{cpt} = 0 \quad (\text{equation 10})$$

$$R_{yct} = 0 \quad (\text{equation 11})$$

The first two correlations proffer the self-evident tautology that the transitory elements of consumption and income occur in a stochastic manner. The third correlation seems illogical until we note that since transitory income is usually spent on consumer durables, the consumption of which takes place in periods of time successive to the act of purchase, and hence constitutes a form of saving rather than transitory consumption, it is not systematically related to transitory consumption. This distinction is central to the theory's reconciliation of the conflicting findings. While the time series surveys would capture the long run relationship $C_p = kY_p$, cross section data captures individuals with positive or negative transitory income.

For instance, consider a consumer with permanent income Y_p and permanent consumption C_p in two situations. In the first scenario, $Y_m = Y_p$ as $Y_t = 0$. In the second scenario, $Y_m = Y_p + Y_t$ as $Y_t > 0$. In both situations, measured consumption C_m will equal C_p , as Y_t will be converted to savings, with a subsequent upward revision of permanent income in the second case. A cross-section study would clearly yield a lower MPC in the second scenario.

Whilst the Permanent Income and Life Cycle hypotheses are clearly not dissimilar, to view them as mutually substitutable would be to overlook the theoretical richness evident in a contrast of both. Here, we note four significant differences between the two theories.

Firstly, wealth does not enter as an explanatory variable in Friedman's model, whereas it is clearly subsumed as V_t in the Life-Cycle Hypothesis. Secondly, the Life-Cycle Hypothesis offers a theoretic rationale as to why the proportionality factor b might change over time. Thirdly, consumption patterns are viewed as evolving from a bequest motive in Friedman's model, whereas Modigliani views them as issuing from the attempts of the young to middle-aged to smooth out a lifetime path. Finally, and most importantly, the Life-Cycle Hypothesis stresses the alleged predictability of income over a lifetime, whereas the Permanent Income Hypothesis stresses the role and existence of stochastic variations in income.

At this stage, we may note that both paradigms model the consumer as being dependent on the capital markets for savings and dissavings purposes. Flemming (1978) has showed that where liquidity constraints exist, the long run consumption function, as derived from normal income theories of this kind, need not be linear.

The reader is directed to the original source for further consideration.

A further note on Friedman's model is warranted. Friedman posited that individuals estimate permanent income from past income, via an error learning process using adaptive expectations:

$$Y_p^t = Y_p^{t-1} + \lambda(Y^t - Y_p^{t-1}) \quad (\text{equation 12})$$

$$\text{or } Y_p^t = \lambda \left(\sum_{n=0}^{t-1} ((1-\lambda)^n (Y^{t-n})) \right) \quad (\text{equation 13})$$

With the advent of the so-called rational expectations revolution in macroeconomics, an alternate view to Friedman's might be expected, such was supplied by Hall.

HALL'S SURPRISE CONSUMPTION FUNCTION

In arguing that wealth estimates, and hence consumption are based on rational expectations, Robert Hall bypassed Friedman's backward looking assessment of permanent income, and the many empirical problems elicited by the measurement of wealth. Hall's argument was that given expectations are rationally formed, and assuming among other things that real interest rates are constant, changes in consumption can be modelled empirically as being determined by news. No past information, such as past changes in consumption or income, affect current changes in consumption.

Mathematically, this may be represented as: $C_t = WC_{t-1} + h_t$ (equation 14)

where h_t denotes "news", the revision in life cycle income between t and $t-1$. As might be expected, the expectation of h_t in time period $t-1$ is zero, thus indicating the unpredictability of h . Equation 12, then, represents the surprise consumption function, according to which consumption should evolve to a random walk with trend.

We note two important implications of Hall's result at this point. Firstly, WC_{t-1} is the best possible forecast of C_t available at $t-1$, given the information available at $t-1$. Secondly, any variables dated $t-1$ or earlier added as regressors to equation 12 should have zero coefficients.

To test his theory, Hall (1978), added additional lagged regressors to the right hand side of equation 12, notably lagged income and second and higher order lagged values of consumption. He then tested the hypotheses that their respective coefficients were zero, using US quarterly data from 1948 to 1977 and found that the F-statistic for the hypothesis that the coefficients on the lagged consumption regressors were zero was 1.7, well below the critical F value of 2.7 at the 95% confidence level. With regard to lagged income, he found a slightly negative coefficient, but this was fully accounted for by sampling variation. His approach seemed justified by the

empirical evidence.

As might be expected, however, theoretical and empirical objections to such a radical view of aggregate consumption have been many; the most articulate being (arguably), Muellbauer, who listed seven theoretical objections to the surprise consumption function, four of which are now listed.

Firstly, Muellbauer pointed to Flemming's critique of Life-Cycle Permanent Income hypotheses; whereby the existence of liquidity constraints led to a question mark being imposed upon such models. Secondly, real interest rates were not constant as Hall had assumed. This implies that the coefficient on C_{t-1} was dependent on real interest rates. Thirdly, Muellbauer questioned whether Hall, in distinguishing between durable and non-durable goods for testing purposes, had been strict enough in his definition of durable goods. Finally, and most importantly, it was noted that Hall's extreme view of rational expectations was unrealistic.

Muellbauer tested for the coefficients of additional lagged regressors, as suggested and previously carried out by Hall. Muellbauer was initially puzzled that the Hall model survived this test for British quarterly data from 1955.4 to 1979.4. He subsequently found a structural break in 1972, when sterling began to float. At that point, the coefficients on the lagged variables changed signs in such a way that the overall coefficients are zero when the two periods are pooled. Consideration of either period in isolation leads to falsification of the model. Interestingly, further tests carried out by Muellbauer failed to establish the cause of this empirical rejection as either being due to the erroneous assumption of real interest rates or the existence of liquidity constraints.

Hall (1989) gives a more qualified restatement of his proposition in the light of a large body of research which forces him to admit that "consumption is fairly close to a random walk, but certain variables have enough predictive power that the hypothesis is rejected in formal statistical tests".

In a substantial review of econometric investigations into the surprise consumption function, he acknowledges the contradiction of his hypothesis yielded by the research of economists such as Muellbauer, Flavin (1981) and Nelson (1987), whilst pointing to the support of econometric research carried out by, amongst others, Stock and West (1987) and Miron (1986). One notes the findings conflict to some degree although an impartial consensus might assume an implied rejection of the random walk model.

A consensus might not be so easily yielded after we consider the research into why the random walk model failed in tests. Hall quotes studies such as Runkle (1983) and Zeldes (1985) which suggest, unlike Muellbauer's 1983 study, that liquidity constraints do have explanatory power for the non-conformity of aggregate consumption to the random walk model. He noted that the durability of certain

consumer goods can also explain departures from his model. Models with durable goods by Mankiw (1984) and Bernanke (1985) accept the hypothesis of no explanatory power from lagged income. More importantly, durable consumption appears to compete with liquidity constraints as an explanatory perspective on the predictive power of lagged variables. Models encompassing both features, such as Hayashi's (1985) survey of Japanese households, leave only a small role for liquidity constraints. It would be foolhardy of this author, however, to pre-empt the results of future research by a hasty judgement of this, as yet, somewhat unresolved issue.

CONCLUSION

This essay has treated heavily of the Keynesian innovation that was the "fundamental psychological law", by a comprehensive review of what Keynes actually said, and the relevance of his consumption function to the Keynesian framework. The impetus it provided for empirical investigation has been noted, and it is argued that these findings in turn provided an impetus for subsequent theories.

The Life-Cycle and Permanent Income Hypotheses have also been detailed, together with their alternate reconciliations of the cross-section and time series results. The existence and role of liquidity constraints have been noted as a possible qualification to these models.

Finally, the implications of rational expectations have been noted in an assessment of Hall's random walk model. It is concluded that a reasonable model of consumption is not provided by such an approach, although the precise reasons why are not clearly yielded by consideration of what is a voluminous and often conflicting set of empirical studies.

We may conclude with a comment from Darby in *The New Palgrave* (1987) to the effect that a "workable consensus" has been reached on the consumption function. Of the remaining issues to be clarified, however, we might especially wish for a better appreciation of the extent to which normal income theories are qualified by the existence of liquidity constraints, and a greater clarification of the reasons for the empirical refutation of the Hall model, as well as, perhaps, greater consistency and agreement across studies as regarding the appropriate methodology for the econometric modelling of consumption.

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